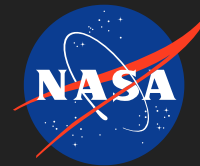


Infusion Resins for Automated Dry Fiber Placement Products, Phase I



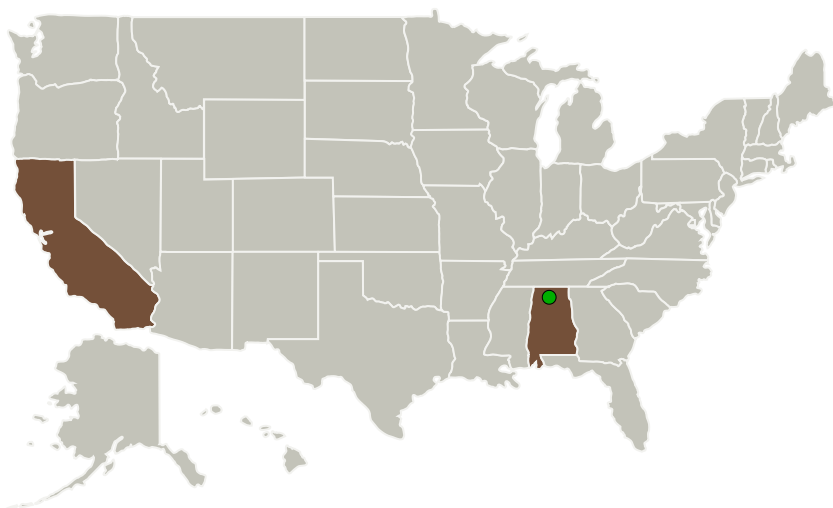
Completed Technology Project (2015 - 2015)

Project Introduction

As the size of composite parts exceed that of even the largest autoclaves, new out-of-autoclave processes and materials are necessary to achieve the same level of performance as autoclave cured composites. As an alternative to OOA prepreg systems, infusion of dry fiber preforms made by dry fiber – AFP can mitigate out-time issues and shelf-life problems combined with lower cost manufacturing. Although improvements in automated dry fiber placement (ADFP) products have continued, use and application of these ADFP products have been limited due to the necessary balance of processing and performance of the infusion resin. This is a result of not only the low permeability of the ADFP product preforms but also the inadequate damage tolerance and micro-crack sensitivity of the developed composites.

Accordingly, Applied Poleramic, Inc. proposes to develop a novel low viscosity, long pot-life infusion resin for use with ADFP product preforms that results in cured performance similar to that of unidirectional Hexcel 8552 prepreg parts. Specifically, the infusion resin will have more than twice the pot-life at lower viscosity as compared to commercial infusion resins along with significantly improved fracture toughness. This will be accomplished through the development of a novel eutectic aromatic amine curing agent and self-assembly nano-modifier. This innovative epoxy infusion resin will enable large complex composite structures to be developed using ADFP product preforms with reduced production time, higher part quality, and a new level of performance not attainable with current commercial infusion resins. Ultimately, the technology will lead to a new generation of low cost composite materials, critical to future NASA space programs and missions.

Primary U.S. Work Locations and Key Partners



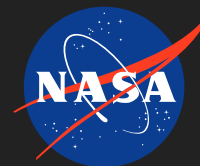
Composite Trends, Hexcel, March (2014) p.1-7; Dry Fiber-AFP
(<http://www.hexcel.com/News/newsletters/Letter-20140220.pdf>)

Infusion Resins for Automated Dry Fiber Placement Products, Phase I

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Infusion Resins for Automated Dry Fiber Placement Products, Phase I



Completed Technology Project (2015 - 2015)

Organizations Performing Work	Role	Type	Location
Applied Poleramic, Inc.	Lead Organization	Industry	Benicia, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

▶ **June 2015:** Project Start

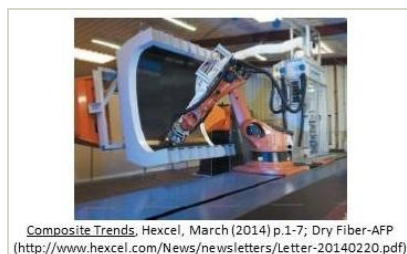
✓ **December 2015:** Closed out

Closeout Summary: Infusion Resins for Automated Dry Fiber Placement Products, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138989>)

Images



Briefing Chart Image

Infusion Resins for Automated Dry Fiber Placement Products, Phase I
(<https://techport.nasa.gov/image/129465>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Poleramic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

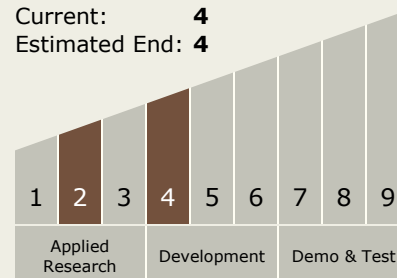
Carlos Torrez

Principal Investigator:

Brian S Hayes

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Infusion Resins for Automated Dry Fiber Placement Products, Phase I

Completed Technology Project (2015 - 2015)



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System